



# Variations of physico-chemical parameters of five different ponds in Changanacherry taluk of Kottayam district

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## General Note



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## ABSTRACT

Water is one of the nature's most important gifts to mankind that is very essential for the sustenance of life. Quality of water is an important criterion for evaluating the suitability of water for irrigation and drinking purposes. This study deals with the study of physico-chemical parameters of water in five different ponds situated in Changanacherry taluk of Kottayam district. The study was made in the monsoon season of 2018. The physico-chemical analysis was extensively carried out on each sample using known standard methods. The results of this analysis point out the fact that all the parameters were within permissible limits prescribed by

BIS water standards for the five ponds except the Pulikkamala pond that got degraded due to the dumping of waste materials. The study reminds the need for conservation of the degraded fresh water ecosystems and their sustainable use that forms a part of our biodiversity.

**Key words:** Dissolved oxygen, chloride, nitrite, phosphate

## 1. INTRODUCTION

Water covers more than 70% of the earth's surface and only 1% of the earth's water is available as a source of drinking water (Basavaraja Simpi et al., 2011). Ponds are common in Kerala and are widely used as source of drinking and domestic purposes. Ponds help to maintain the ecological balance. Ponds were used as irrigation water source and provide habitat for fresh water lives. More than 50% of these water bodies are on the verge of extinction (Sharma et al., 2005). There has been a trend to reclaim these water bodies for developmental activities.

The present study involves the analysis of water quality in terms of physic-chemical parameters of five different ponds in monsoon season. The five ponds such as Vaipur, Kulathoor, Punnaveli, Aanikkadu and Pulikkamala situated in Kottayam district were taken. On the view, out of the five ponds Pulikkamala getting degraded due to the dumping of industrial and agricultural effluents and domestic sewages in an uncontrolled manner. The remaining four are partially or completely pure for different purposes. The main objective of this study is to identify the water quality of these ponds for comparing the pollution strength. The study might be a reminder for the need for restoration of the degraded water quality of the pond. This will create awareness among people to improve the water quality status and the need for the conservation these natural resources.

## 2. MATERIALS AND METHODS

The present study was conducted during the monsoon season, and the water samples were collected from five different ponds situated in Vaipur, Kulathoor, Punnaveli, Aanikkadu and Pulikkamala in the Kottayam district. Five water samples were collected in clean polyethylene bottles without any air bubbles and were brought to the laboratory. The hydrological parameters such as water temperature,  $p^H$ , dissolved oxygen, carbon dioxide, chloride, Fluoride, nitrate, nitrite, ammonia, phosphate, iron, total hardness and transparency were analysed (APHA, 1998).

## 3. RESULTS & DISCUSSION

Globally, people are under tremendous threat due to undesired changes in the physical, chemical and biological characteristics of air, water and soil. In the present study the concentration of all parameters in all samples except in pond 5 were within permissible limit as prescribed by BIS standard.

In monsoon season the water temperature is lower than the atmospheric temperature. In this study it ranged from 28 to 29 °C. All metabolic and physiological activities of the aquatic organisms are greatly influenced by water temperature. A degree of variation in the temperature of the water body has great bearing up on its productivity potential also. The variation recorded in present study was not very great and as such it could not bring out any drastic fluctuation in the dynamics of the pond ecosystem of water study. In pond Pulikkamala, the  $P^H$  is less than 7 it indicates that pond water is acidic while others are slightly alkaline or neutral. The higher pH values observed suggests that carbon dioxide, carbonate-bicarbonate equilibrium is affected more due to changes in physico-chemical condition (Karanth, 1987). In this study the dissolved oxygen ranged from 2.8 to 4.9 mg/l. In Pulikkamala pond, the DO is very low while others are in permissible limits. Its correlation with water body gives direct and indirect information of the bacterial activity, photosynthesis (Krishnamurthy, 1990). So the numbers of fishes are very less in Pulikkamala. Fish kills due to low oxygen are most common during hot, dry spells when algae grow and then die quickly, availability of nutrients, stratification etc. (Premlata Vikal, 2009).

**Table 1** The variations in physico-chemical parameters

Sl no	Parameters	Pond 1	Pond 2	Pond 3	Pond 4	Pond 5	BIS std
1	Temperature (°C)	28	28.5	28.2	28.1	28.9	.....
2	pH	7.1	7.5	7.6	7.4	6.1	6.5-9.2
3	Dissolved oxygen(mg/l)	4.9	4.1	4.7	4.2	2.8	4-6

4	Free CO <sub>2</sub> (mg/l)	2.9	3.1	3.4	3.2	6.1	12
5	Chloride(mg/l)	12	14	10	15	32	250
6	Fluoride (mg/l)	–	0.035	–	–	0.071	1.5
7	Nitrate(mg/l)	2.1	5.5	6.1	5.2	9.9	45
8	Nitrite(mg/l)	–	–	–	–	0.25	
9	Ammonium(mg/l)	–	–	–	–	1.1	1.5
10	Phosphate(mg/l)	–	–	–	–	0.5	1-5
11	Iron(mg/l)	–	–	–	–	–	1.0
12	Total hardness(mg/l)	20	25	35	29	52	600
13	Secchi disc	49.9	54	52	57	105.5	.....



VAIPUR



KULATHOOR



PUNNAVELI



AANIKKADU



PULIKKAMALA

PHOTOGRAPHS OF FIVE DIFFERENT PONDS IN KOTTAYAM DISTRICT

The amount of carbon dioxide ranges from 2.9 to 6.1 mg/l. All are within permissible limit. High range found in Pulikkamala pond. Most of the carbon dioxide in water comes from the decay of organic materials and from respiration that occurs in both plants and animals. The amount of chloride ranged from 10 to 32mg/l. The high was value noted in Pulikkamala pond. The main potential health hazards are eye and nose irritation; stomach discomfort, increased corrosive character of water. Fluoride was present only in pond 2 (Kulathoor) and pond 5 (Pulikkamala). But it was found below the BIS standard limit. The rate of fluoride found in pond 2 and pond 5 is 0.035 and 0.071mg/l respectively. Excess fluoride has intake through drinking cause dental, skeletal

and non-skeletal fluorosis. The rate of nitrate ranged from 2.1 to 9.9mg/l and about 0.25 mg/l of nitrite present only in Pulikkamala pond. Ammonium and Phosphate present only in Pulikkamala pond but absent in other 4 ponds. So the 4 ponds are pure than the Pulikkamala pond. Hardness was high in Pulikkamala pond.

From the result, it can be concluded that in the present study the concentration of all the parameters in the entire samples were found in permissible limit as prescribed by BIS standards. But the fifth pond Pulikkamala was polluted than others because dumping of agricultural effluents and domestic sewages in an uncontrolled manner. The remaining 4 ponds are pollution free and is suitable for fisheries and irrigation purposes.

#### 4. CONCLUSION

In the present study the concentration of all the parameters in all samples were found within the permissible limit as prescribed by BIS standard. The concentrations of Nutrients were also found below the BIS standard limit. But in pond 5 (Pulikkamala) the rate of nutrients were high comparing with the other ponds. So it will cause Eutrophication. As nutrient level rise, growth of phytoplankton is no longer nutrient-limited and an algal bloom occurs. If the blooming algae produce toxic chemicals, fish kills and adverse human health effects can occur. There aren't any industries around these ponds, so the metals like Fe were absent. It is also interesting to know that the ponds Vaipur, Kulathoor, Punnaveli, Aanikkadu were pollution free from fertilizers and pesticides. While Pulikkamala pond is polluted because of dumping of agricultural effluents and domestic sewages in an uncontrolled manner. Four ponds except Pulikkamala were suitable for fisheries, drinking and irrigation purpose. But the Pulikkamala pond is not used for drinking and irrigation purpose because it will cause eye/nose irritation, skin diseases, stomach discomfort etc due to the presence of nutrients and other parameters near the BIS standard limit. So this pond can convert for aquaculture.

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#### Conflict of Interest:

The authors declare that there are no conflicts of interests.

#### Peer-review:

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#### Data and materials availability:

All data associated with this study are present in the paper.

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